Airway Management In Burn Intensive Care Unit

An Essay

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In General Intensive Care

By

Abd Elhady Samir Beshir Mohamed

M.B.B.CH (Alazhar University)

Under Supervision of

Prof. Nermin Sadek Nasr

Professor of Anesthesia, Intensive Care and Pain management
Faculty of Medicine – Ain Shams University

Dr. Ghada Mohamed Samir

Lecturer of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine – Ain Shams University

Dr. Rania Hassan Abdel Hafiez

Lecturer of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine – Ain Shams University

Faculty of Medicine
Ain Shams University
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Abd Elhady Samir Beshir

List of Tables

List of Figures

List of Abbreviations

AD	:	Anno Domini
ALI	:	Acute Lung Injury
APRV	:	Airway Pressure Release Ventilation
ARDS	:	Acute Respiratory Distress Syndrome
ATA	:	Atmosphere Absolute
ATP	:	Adenosine Triphosphate
ATPase	:	Adenosine Triphosphatase
BAL	:	Bronchoalveolar Lavage
BC	:	Before Christ
C	:	Celsius
CK	:	Creatine Kinase
CT	:	Computed Tomography
CMV	:	Conventional Mechanical Ventilation
CO	:	Carbon Monoxide
CO	:	Cardiac Output
COHb	:	Carboxyhemoglobin
CPAP	:	Continuous Positive Airway Pressure
CPR	:	Cardiopulmonary Resuscitation
DIC	:	Disseminated Intravascular Coagulation
DNA	:	Deoxyribonucleic Acid
ECG	:	Electrocardiography
ED	:	Emergency Department
EF	:	Ejection Fraction
ETT	:	Endotracheal Intubation
FiO2	:	Fraction Of Inspired Oxygen
HBO	:	Hyperbaric Oxygen
HCN	:	Hydrogen cyanide
HFOV	:	High Frequency Oscillatory Ventilation
HFPV	:	High-frequency percussive ventilation
IFN	:	Interferon
IL	:	Interleukin
iNOS	:	Inducible Nitric Oxide Synthase
LOS	:	length of stay

List of Abbreviations(cont…)

MV	:	Mechanical Ventilation
NAC	:	N-acetylcystine
NF	:	Nuclear factor
NEJM	:	New England Journal of Medicine
nNOS	:	Neuronal Nitric Oxide Synthase
NOS	:	Nitric Oxide Synthase
O2Hb	:	oxyhemoglobin
PAC	:	Pulmonary Artery Catheter
PaCO2	:	Partial Pressure Arterial Carbon Dioxide
PaO2	:	Partial Pressure Arterial Oxygen
PBW	:	Predicted Body Weight
Pc	:	Capillary Pressure
PEEP	:	Positive end Expiratory Pressure
PG	:	Prostaglandins
Pplat	:	Plateau Pressure
PVD	:	prolonged ventilator dependence
RADS	:	Reactive Airways Dysfunction Syndrome
RNS	:	Reactive nitrogen species
ROS	:	Reactive oxygen species
SIRS	:	Systemic Inflammatory Response Syndrome
SPECT	:	Single photonemission computed tomography
TBSA	:	Total Body Surface Area
TBVI	:	Total Circulating Blood Volume Index
Th	:	T-Helper
TNF	:	Tumor Necrosis Factor
VAP	:	Ventilator Associated Pneumonia
VDR	:	Volume Diffusive Respirator
VILI	:	Ventilatory Induced Lung Injury
Vt	:	Tidal Volume

Contents

Page No.

Airway Management in Burn Intensive Care unit

Prof. Nermin Sadeq Nasr*, Dr.Ghada Mohamed Samir**, Dr Rania Hassan Abdel Hafiez& Abd Elhady Samir Beshir*******

*****Professor of Anesthesia, Intensive Care and Pain management. Faculty of Medicine, Ain Shams University
******Lecturer of Anesthesia, Intensive Care and Pain Management. Faculty of Medicine, Ain Shams University *******Lecturer of Anesthesia, Intensive Care and Pain Management. Faculty of Medicine, Ain Shams University
****First author

Abstract

Introduction: Smoke inhalation injury is divided into thermal injury, chemical irritation of the respiratory tract and systemic toxicity due to toxic gases. The upper airway inhalation injury occurs mostly due to thermal injury and may be complicated by sinusitis, upper airway obstruction, upper airway stricture and/or vocal cord paralysis. Lower airway inhalation injury is usually caused by chemicals in smoke and may be complicated by reactive airway dysfunction syndrome, pulmonary oedema, acute respiratory distress syndrome, pneumonia, pulmonary embolism, bronchiolitis obliterans, chronic bronchitis, bronchiectasis and/or tracheal stenosis.

Conclusions: Airway management is an extremely important considerationin in the care of burn victims. If not done in a timely manner, lethal complications may result consequently. There are three distinguishable types of airway inhalation injury which are carbon monoxide poisoning, inhalation injury above the glottis and inhalation injury below the glottis. The onset of symptoms associated with all types of inhalation injury is so unpredictable that the patient must be observed closely for complications.

Key words: Airway Management - Inhalation injury.

References:

Ayodele OI, Samuel AA, Olayinka O, et al. Comparative Review of Burns With Inhalation Injury in a Tertiary Hospital in a Developing Country. 2016; 28(1):1-6.

Hampson NB, Piantadosi CA, Thom SR, et al. Practice recommendations in the diagnosis, management, and prevention of carbon monoxide poisoning. Am J Respir Crit Care Med, 2016; 186:1095-1101.

INTRODUCTION

The art of airway management is as old as medicine itself. There is evidence that the tracheostomy operation was portrayed on Egyptian tablets dating back to 3,600 BC, while reference to the procedure can be found in ancient Hindu scriptures dating from 2000 BC. Later, in 100 AD, Antyllus described tracheostomy as a horizontal incision between 2 tracheal rings to bypass upper airway obstruction. In 1880, in Scotland, William Macewen discussed how to relieve airway obstruction by passing an oral tube into the trachea. The next important development in airway management was thus the development of direct laryngoscopy ***(Adrian, 2016).***

Airway management is a very important consideration in the care of burn victims. If not done in a timely manner, fatal complications may result consequently. There are three distinguishable types of airway inhalation injury which are inhalation injury above the glottis, inhalation injury below the glottis and carbon monoxide poisoning. The onset of symptoms associated with all types of inhalation injury is so unpredictable that the patient must be observed closely for complications ***(*Ayodele *et al., 2016).***

Despite advances in artificial ventilation management, inhalation injury remains a main cause of death in adult burn

victims. Upper airway edema following a burn injury can occur rapidly. Among patients who have smoke inhalation, a large percentage develops complete airway obstruction and there are no clinical tools to determine which patients will do so. Fluid resuscitation can increase laryngeal swelling, thus increasing the difficulty of tracheal intubation. Therefore, intubation should be carried out soon if severe inhalation injury is present or anticipated. A significant percentage of intubated burn patients will develop acute respiratory distress syndrome ***(Philip and Dennis, 2015).***

Inhalation injury occurs at the level of alveoli .This type of injury occurs late due to irritation by chemicals in smoke. Monitoring is essential to detect the need for mechanical ventilation. Carbon monoxide is the main cause of death in smoke inhalation. Its half-life in the blood is about 4 hours; which can be decreased to about one hour on 100% oxygen breathing. Hyperbaric oxygen therapy will further decrease the half life of CO in the blood **(Patrick *et al., 2015).***

AIM OF THE WORK

The aim of this essay is to discuss airway *management of burn patient in burn intensive care unit.*

ANATOMICAL CONSIDERATIONS OF AIRWAY

The airway is a complicated and delicate organ carrying out very precise functions. The lungs are safely encased in and protected by the rib cage. They are vulnerable where they have to come into contact with the outside world. The long passage leading to it from the nostrils is charged with some important functions which are essentially protective. The airway needs to be treated with respect, and the more we understand it, the less the harm that we do to patients ***(Rajagopal and Jerry, 2005)*.**

I. Upper airway

The nose and the mouth are the two opening of the upper airway (fig. 1, 2). The floor of the nose makes the roof of the mouth. The nose ends into the nasopharynx and the mouth leads to the oropharynx. The two are separated anteriorly by the palate, and they continue posteriorly as the pharynx. The base of the epiglottis separates the oropharynx and the laryngopharynx. The larynx continues into the trachea ***(Harold et al., 2008)*.**

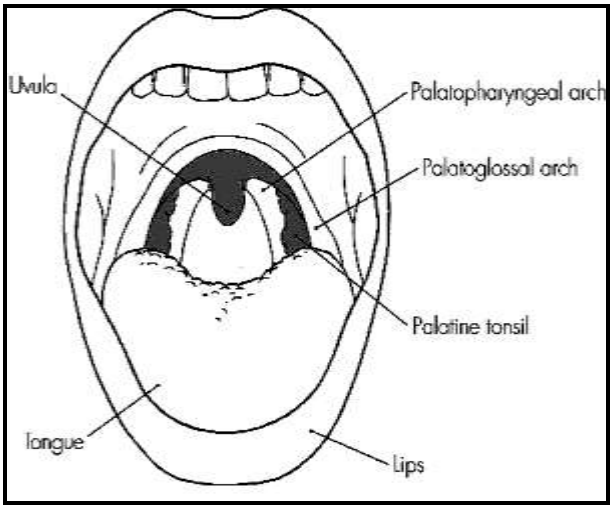

Fig. (1): Anatomy of the mouth ***(Andreas, 2001).***

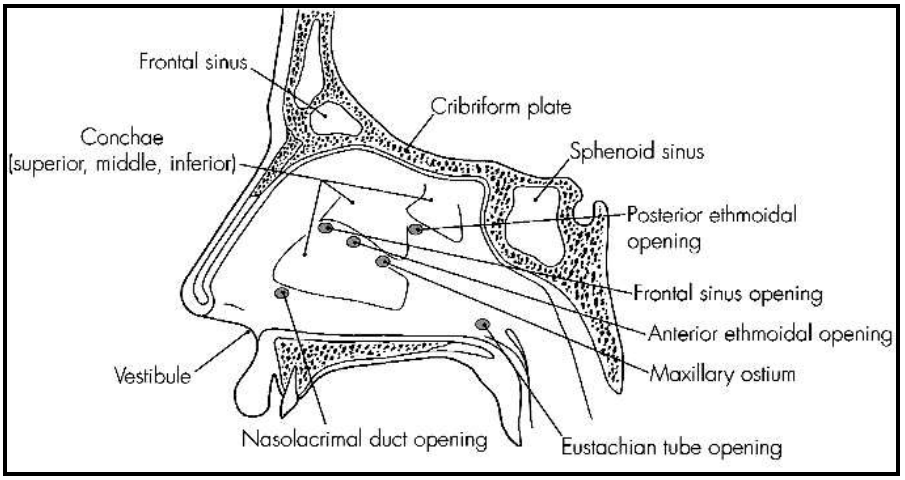

Fig. (2): Anatomy of the nose ***(Andreas, 2001).***

1. The mouth:

The mouth is made up of the vestibule and the mouth cavity, the former communicating with the later through the aperture

of the mouth. The palate forms the roof of the mouth and the floor of the nasal cavity ***(Harold et al., 2008).***

2. The nose:

It is the peripheral olfactory organ or the organ of smell. It consists of two parts: ***the external nose,*** which is placed in the center of the face; and ***the nasal cavity*** that is divided by a septum into right and left nasal chambers ***(Harold et al., 2008).***

3. The pharynx:

The pharynx is the tube which is placed behind the nasal cavities, mouth, and larynx. Those three structures divide it into three parts, the nasopharynx, oropharynx and laryngopharynx, respectively. It is a musculomembranous tube, its shape is conical, with the base upward, and the apex downward, extending from the lower surface of the skull to the level of the cricoid cartilage anteriorly, and that of the sixth cervical vertebra posreriorly ***(Mikhail et al., 2006).***

4. The larynx:

The larynx is placed at the upper part of the air passage (fig. 3), it is found between the root of the tongue and the trachea. The great vessels of the neck lie on both sides of it. It lies opposite to the fourth, fifth, and sixth cervical vertebrae, but

it is placed higher in the female and also during childhood ***(Andreas, 2001)*.**

A. Size of the larynx:

The size of the larynx is the same in boys and girls. After puberty the antero- posterior diameter of the larynx nearly doubles in males ***(Andreas, 2001)*.**

B. Dimentions of the larynx:

Table (1): Dimensions of larynx:

Sex	Length	Transverse Diameter	Antero Posterior Diameter
Male	44mm	43mm	36mm
Female	36mm	41mm	26mm

(Andreas, 2001)

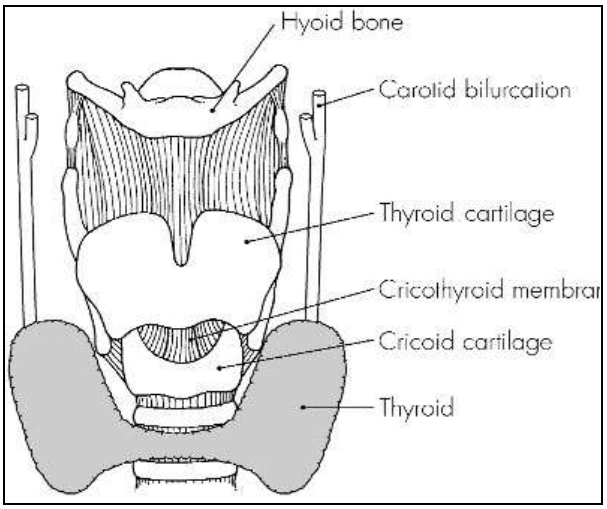

Fig. (3): Anatomy of larynx ***(Andreas, 2001)*.**